



Ser. No. 10/801,215

Amendments to the Claims

1. (Previously presented) An apparatus for cleaning one or more surfaces within a vessel having a vessel wall separating a vessel exterior from a vessel interior and having a wall aperture, the apparatus comprising:

at least one elongate conduit having an upstream first end and a downstream second end and positioned to direct a shockwave from the second end into the vessel interior; and

a source of fuel and oxidizer coupled to the conduit to deliver the fuel and oxidizer to the conduit;

an initiator positioned to initiate a reaction of the fuel and oxidizer to produce the shockwave;

at least one sensor for sensing one or more thermodynamic properties associated with the vessel and including means for ion sensing; and

a control system coupled to the initiator, the source, and the sensor for receiving input from the sensor and controlling operation of the initiator and source responsive to said input.

2. (Original) The apparatus of claim 1 wherein:

there are a plurality of such sensors including at least one temperature sensor and at least one pressure sensor.

3. (Original) The apparatus of claim 1 wherein:

there are a plurality of such sensors including at least one thermocouple positioned on the conduit or on the vessel and at least one infrared sensor.

4. (Original) The apparatus of claim 3 wherein:

the at least one infrared sensor includes an infrared camera.

5. (Original) The apparatus of claim 1 wherein:

there are a plurality of such sensors including at least one combustion emission sensor.

Ser. No. 10/801,215

6. (Original) The apparatus of claim 1 wherein:
there are a plurality of such conduits and such initiators, each of the conduits associated with an associated one or more of the initiators; and
the control system includes:
a plurality of local controllers respectively associated with and so coupled to an associated one of the initiators; and
a central controller coupled to the plurality of local controllers .
7. (Original) The apparatus of claim 6 wherein:
the central controller is programmed to generate maintenance or service requests responsive to the input.
8. (Original) The apparatus of claim 1 wherein:
the control system communicates with a remote monitoring system.
9. (Original) The apparatus of claim 1 wherein:
the control system is programmed to control operation of the conduit responsive to input from the sensor.
10. (Original) The apparatus of claim 1 wherein:
the control system is programmed with a plurality of different cleaning processes and to execute the processes responsive to corresponding sensed conditions.
11. (Original) The apparatus of claim 1 further comprising:
an imaging inspection camera coupled to the control system for visual monitoring of the vessel interior.
- 12-22. (Canceled)
23. (Previously presented) The apparatus of claim 1 wherein:

Ser. No. 10/801,215

the control system and sensor combination is configured to detect one or more chemical species.

24. (Previously presented) The apparatus of claim 1 wherein:
the means includes at least one conduit-mounted ionization probe.
25. (Previously presented) The apparatus of claim 24 wherein:
the control system and at least one conduit-mounted ionization probe are configured to verify detonation.
26. (Previously presented) The apparatus of claim 24 wherein:
the at least one conduit-mounted ionization probe comprises two probes longitudinally spaced apart.
27. (Previously presented) The apparatus of claim 1 wherein:
the control system and sensor combination is configured to determine a condition of the apparatus.
28. (Previously presented) The apparatus of claim 1 wherein:
the control system and sensor combination is configured to verify detonation.
29. (Previously presented) The apparatus of claim 1 wherein:
the control system and sensor combination is configured provide an indication of chemical emissions.
30. (Previously presented) An apparatus for cleaning one or more surfaces within a vessel having a vessel wall separating a vessel exterior from a vessel interior and having a wall aperture, the apparatus comprising:
at least one elongate conduit having an upstream first end and a downstream second end and positioned to direct a shockwave from the second end into the vessel interior; and

Ser. No. 10/801,215

a source of fuel and oxidizer coupled to the conduit to deliver the fuel and oxidizer to the conduit;

an initiator positioned to initiate a reaction of the fuel and oxidizer to produce the shockwave;

means for detecting one or more chemical species; and

a control system coupled to the initiator, the source, and the sensor for receiving input from the sensor and controlling operation of the initiator and source responsive to said input.

31. (Currently amended) The apparatus of claim 30 wherein:

the control system and ~~sensor~~ means for detecting combination is configured provide an indication of chemical emissions including at least one of CH^\cdot and OH^\cdot .

32. (Previously presented) An apparatus for cleaning one or more surfaces within a vessel having a vessel wall separating a vessel exterior from a vessel interior and having a wall aperture, the apparatus comprising:

at least one elongate conduit having an upstream first end and a downstream second end and positioned to direct a shockwave from the second end into the vessel interior; and

a source of fuel and oxidizer coupled to the conduit to deliver the fuel and oxidizer to the conduit;

an initiator positioned to initiate a reaction of the fuel and oxidizer to produce the shockwave;

a sensor detecting one or more chemical species; and

a control system coupled to the initiator, the source, and the sensor for receiving input from the sensor and controlling operation of the initiator and source responsive to said input.